Vol. 16 JUNE, 1951 No. 6

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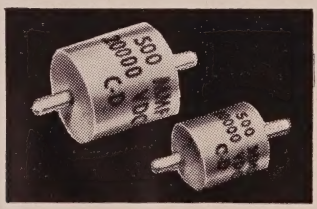

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EMERGENCY TV TROUBLE SHOOTING WITH COMMON TEST INSTRUMENTS

Standard practice dictates the use of several specialized and expensive test instruments in the servicing of television receivers. These instruments, which have been listed repeatedly in service literature, include the sweep generator, marker generator, kilovoltmeter, linearity pattern (cross hatch) generator, and wide-band oscilloscope.

The Editors do not mean to minimize the importance of any of these instruments. The function of each is well established and TV test gear should be used whenever it is accessible. We desire to point out, however, that *conventional* service instruments can be used to advantage in TV servicing when *special* television equipment is not available. In some instances, trouble shooting or adjustment may be somewhat slower with conventional service instruments than with special TV equipment. But speed will assume secondary importance when a test **must** be made and special equipment is not available. This article will explain how certain conventional radio test instruments may be employed in television trouble shooting.

While this article covers only basic operations, it should stimulate thinking on the subject. The service technician while studying the methods outlined in this article should devise related methods for using his own conventional equipment for TV servicing. We feel that additional test procedures will occur to the studious reader.

Uses of the Conventional AM Signal Generator

The conventional amplitude modulated signal generator may be employed in TV trouble shooting as well as in alignment. While it is desirable to have this instrument deliver fundamental frequencies as high as 230 megacycles and be provided with high-voltage (usually 1-volt) output in addition to the regular attenuator output, the more common service test oscillator (with a maximum RF output of 0.02 to 0.1 v. and fundamental frequency coverage to 30 mc.) may be used.

Overall Operation Test. This is a quick test to determine if the TV receiver is operating "throughout" and can be performed when an antenna is not available or when no station is transmitting. It establishes readily the operating condition of the set and can, to some extent, reveal which channels of the receiver are misaligned or operating incorrectly for any other reason.

This test is performed in the following manner. (1) Connect the signal generator output to the TV receiver antenna terminals, but with no antenna connected to the set. Two equal ½-watt carbon resistors should be connected in the signal generator leads near the receiver, as shown in Figure 1. These resistors serve to match the generator impedance to the receiver

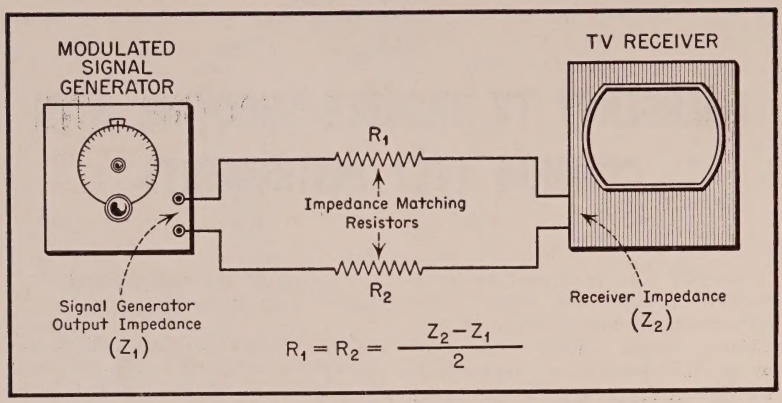

Fig. 1. Use of signal generator to determine T.V. receiver operating condition.

input impedance. Each required resistance (in ohms) may be determined by subtracting the output impedance of the signal generator (ohms) from the input impedance of the set (ohms) and dividing by 2. Thus; in the case of a signal generator having 15 ohms output impedance, and a receiver with 300 ohms input impedance, the resistors each will be equal to (300 — 15)/2, which is 285/2 or 142.5 ohms. (2) Switch-on both the generator and receiver and set the receiver tuning to one of the TV channels (any channel will do). (3) Switch-on the internal amplitude modulation of the signal generator, and adjust the output attenuator for about ¼ maximum output. (4) Tune the generator up toward the lower frequency limit of the channel to which the set is tuned. If the generator will not reach the receiver frequency on fundamentals, a lower frequency may be employed, provided it is in harmonic relation with the receiver frequency. (5) As the lower edge of the channel is passed in the generator tuning, a sharp hiss may be heard in the loudspeaker. (6) Continue to tune the generator slowly upward in frequency. (7) Dark, horizontal sound bars will begin to appear on the picture-tube screen. (8) As the generator is tuned higher in frequency, these bars will become very distinct and at a still higher frequency will disappear sharply. (9) As the generator is tuned still higher in frequency, the modulation tone from the generator will be heard in the speaker. The audio tone will tune-in and out rather sharply as this point is passed in the generator tuning, and then will tune in and out a second time just a little higher in frequency. (10) At a still higher frequency of the generator near the high-frequency end of the channel, the horizontal sound bars may reappear rather indistinctly. (11) The entire test may be repeated for each channel.

This test gives a quick check of the entire receiver. The sound bars which appear on the screen are produced by the internal amplitude modulation of the signal generator. They can appear on the screen only if the front-end tuner, video IF, video detector, video amplifier, power supplies, deflection circuits, and picture tube are operating.

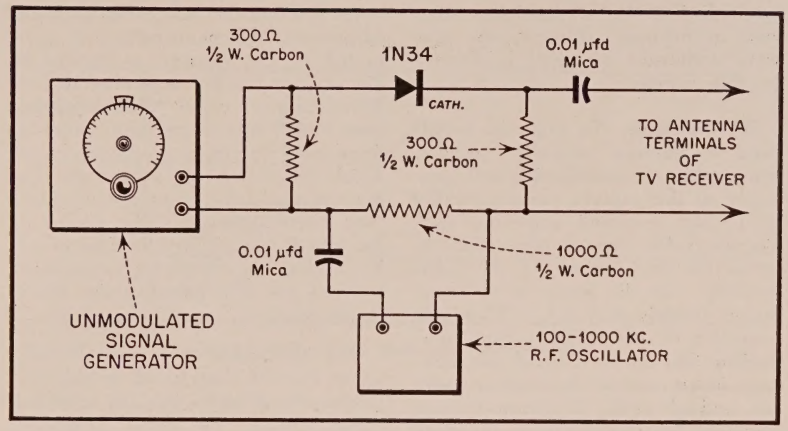

Fig. 2. External high-frequency modulator.

The two sound "peaks" in the speaker indicate proper alignment of the FM discriminator or ratio detector in the sound channel of the receiver. The horizontal sound bars should disappear from the screen when the modulating tone is heard. If they do not, the sound traps are out of adjustment. With the bars on the screen, operation of the vertical hold, vertical linearity, contrast, brightness, and fine tuning controls may be checked.

Linearity Patterns. It has already been shown in the foregoing section that horizontal bars will appear on the screen when the amplitude modulated signal generator is tuned to the video carrier frequency. These bars should remain on the screen with undiminished intensity as the generator is tuned through the video band. The vertical linearity control may be checked and the linearity circuit adjusted by using these bars for reference. Vertical bars for adjustment of horizontal linearity may be generated by switching-off the 400-cycle modulator of the signal generator and modulating with a high frequency, 100 kc. or higher. Connections to the TV receiver are made in the same manner shown in Figure 1.

There will be some difficulty in modulating the signal generator at the high frequency (through the EXTERNAL MODULATION input terminals) unless the high-frequency modulating source is able to deliver a high signal voltage (25 to 30 v.) to overcome losses in the internal modulating transformer. A more efficient job can be done by means of the crystal diode modulator shown in Figure 2. This is an external amplitude modulator which allows a high or low-frequency modulating signal to be superimposed upon the unmodulated (CW) RF output of the signal generator.

The number of bars appearing on the screen may be changed at will by adjusting the frequency of the modulating oscillator. This applies to both vertical and horizontal bars. It should be pointed out that a square-wave modulating voltage produces a much

more distinct bar or line than sine-wave modulation. However, the sine-wave modulation is entirely satisfactory for this purpose.

IF Alignment. To align the broad-band IF amplifier of a TV receiver, connect the unmodulated signal generator to the antenna input terminals or to the front-end converter grid. Connect a DC vacuum tube voltmeter across the load resistor of the video detector. Set the meter to its lowest range (usually 0-3 v.). Tune the generator to one of the several intermediate frequencies given in the alignment instructions for the receiver under test, and adjust the IF trimmers corresponding to this frequency for peak deflection of the v. t. voltmeter. Raise the output of the signal generator, if necessary, to give an accurately readable meter deflection. In some sets, it may be necessary to put the AGC out of operation. Next, set the generator to another of the intermediate frequencies and adjust the corresponding IF trimmers for peak deflection of the meter. Repeat this procedure for each of the intermediate frequencies given in the receiver alignment instructions. Finally, reduce the signal generator output for a meter reading about one-half of that previously used, and re-adjust each set of IF trimmers at the applicable frequencies. With most sets, it will be possible to force plenty of signal into the IF amplifier when the signal generator is connected to the receiver antenna terminals. In other cases, as when the set is badly out of alignment, the IF signal may be introduced into the video IF amplifier via the converter control grid.

Checking Bandwidth. In the absence of a sweep generator, bandwidth of the entire receiver or of the IF amplifier may be checked by means of the conventional signal generator swept through the pass band, by hand adjustment. If the generator is connected to the receiver as shown in Figure 1 and tuned according to the directions given under **"Overall Operation Test,"** video bandwidth may be determined by noting the frequency at which the sound bars first appear on the screen and the frequency at which they later disappear. The width of the sound channel may be determined by noting the frequency separation between the two sound peaks heard in the speaker.

The bandwidth of a video IF amplifier may be determined directly by feeding the IF signal into the amplifier input, tuning the signal generator slowly from the low-frequency end of the IF band to above the high-frequency end, and drawing a curve in which the deflections of a DC vacuum tube voltmeter (connected across the video detector load resistor) are plotted against signal generator frequency settings. For quick determinations, it will be necessary to spot only three or four frequencies throughout the pass band.

Uses of the Vacuum Tube Voltmeter

High Voltage Measurement. The electronic DC voltmeter is standard equipment in all service shops. This instrument is adapted readily for measurement of the high DC anode potential of a TV picture tube. Commercial high-voltage probes ordinarily are used for this purpose. If a special probe is not available, an external high-resistance multiplier may be constructed, often from spare resistors.

The external multiplier must be made by connecting in series not less than ten 1-watt carbon resistors (of proper ohmage) in order that the high

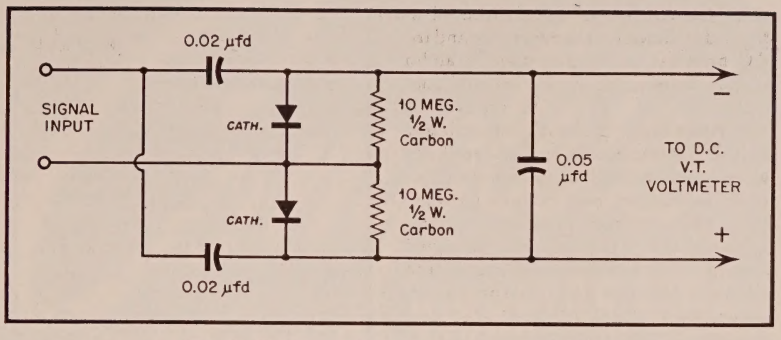

Fig. 3. Peak-to-peak probe for V.T. voltmeter.

voltage may be divided safely between the resistors. Use the 1000-volt range of the v. t. voltmeter for a full-scale deflection of either 10,000 or 30,000 volts. The resistance of the external multiplier required for 10,000 v. must equal 9 times the normal input resistance of the v. t. voltmeter. Similarly, the external multiplier resistance required for 30,000 v. must equal 29 times the normal input resistance of the meter.

CAUTION — Extraordinary care must be exercised in the construction and use of an external high-voltage multiplier in order to avoid physical contact with any part of the operator's body.

Low-Voltage Measurements. The v. t. voltmeter may be used in the normal manner for measurement of all low circuit voltages. These include plate, screen, cathode, grid, and heater potentials.

It must be remembered, however, that several of the alternating signal voltages in a TV receiver have non-sinusoidal waveforms. These irregular shapes will introduce an error in voltmeter readings. The most reliable measurement of these voltages is the peak-to-peak value. Only a few v. t. voltmeters are equipped for p-p readings. However, the technician may build a special probe which will adapt his DC vacuum tube voltmeter for peak-to-peak AC measurements. Figure 3 shows the circuit for a probe of this type.

The p-p probe may be built with two germanium crystal diodes or with a twin diode tube, such as Type 6AL5 or 6H6. This attachment is used with the DC v. t. voltmeter, and the DC scale is read directly to obtain the peak-to-peak value of the applied AC signal voltage. Some error is introduced below about 2 volts because of non-linearity of the diodes.

Signal Tracing. When a signal is applied to the antenna input terminals of the TV receiver (either with a signal generator or by pickup of a TV broadcast station), the conventional v. t. voltmeter may be employed to trace the signal through the various stages of the set. Either the AC, RF, or DC ranges of the meter are used, depending upon the part of each stage being checked for signal presence. Thus, the RF probe may be used to detect strength of the signal at an IF

grid; the DC probe would be used at the video detector output; the standard AC probe at the grid of the 1st audio stage. In general, it may be said that signal tracing in a TV receiver is qualitative only, since the complexity of the TV waveform reduces accuracy of voltage indications unless peak-to-peak values (or peak values in some instances) are measured. The chief value of the voltmeter-type of signal tracing is to establish **presence** of the signal at a given point in the circuit, rather than signal strength.

Checking Resistance of Components. Since the service-type v.t. voltmeter also is an electronic ohmmeter, it can and should be used to check the condition of such circuit components as capacitors, resistors, selenium rectifiers, and crystal diodes. Often, the component will, because of some unusual appearance, arouse the technician's suspicion as to its condition. A capacitor which has leaked wax is an example. Major trouble in a circuit frequently is spotted "by sight" in this manner. The ohmmeter serves to confirm the technician's suspicions.

Capacitors should be replaced when they give a reading of 500 megohms or lower after being connected to the ohmmeter for 1 minute. Crystal diodes and selenium rectifiers in good condition will give a high resistance reading when the positive terminal of the ohmmeter is connected to the cathode of the component, and a low resistance reading when the positive ohmmeter lead is connected to the cathode. There should be a sizeable difference between these two readings. A high "front-to-back" resistance ratio of this type indicates a good crystal or rectifier.

At least one lead of a component should be disconnected temporarily from the receiver circuit before checking with the ohmmeter.

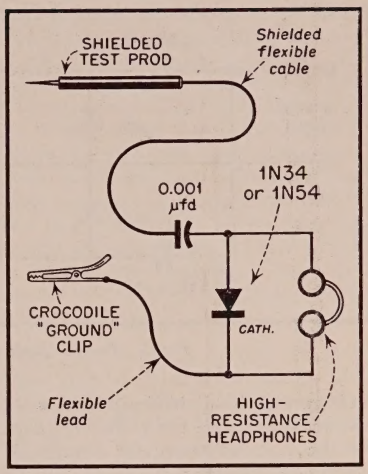

Fig. 4. "Listening Probe" for signal exploration.

Use of Headphones

A pair of high-resistance headphones will be invaluable in an emergency for checking for the presence of a signal in various parts of a TV receiver.

The headphones may be used directly with a 0.1 mfd. 1000-volt capacitor (for protection and isolation) to check operation of audio stages. A germanium diode and isolating capacitor, in the circuit shown in Figure 4, will be required when checking in the other signal circuits. The signal buzz may be picked up with this probe circuit at all points from the early video IF stages to the grid of the picture tube. When the signal voltage is of low intensity, a small audio amplifier may be inserted between the probe and headphones to build up the modulation buzz to audible strength.

When using headphones, with or without the crystal front-end, avoid the high-voltage circuits, deflection oscillators, and magnetic deflection coils.

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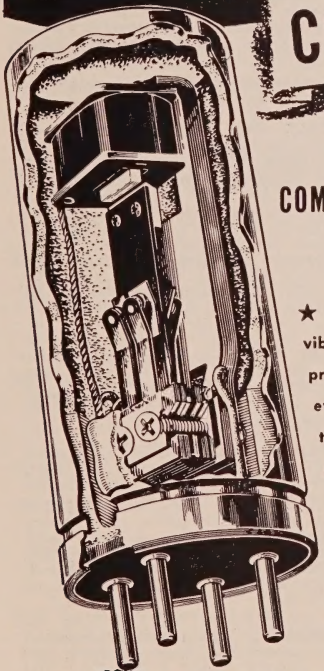

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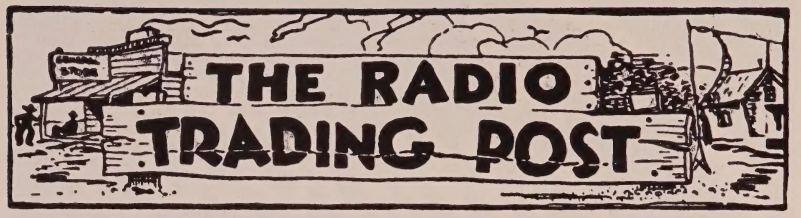

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FOR SALE—1950 Heathkit scope, wired ready to use; 1950 Heathkit TV alignment and marker gen., wired ready to calibrate. Both excellent, $35 ea. f.o.b. Imhof's Radio Service, New Bethlehem, Pa.

FOR SALE—One kilowatt transmitter parts dirt cheap. Main transformer, 110-220V primary. 10400V CT at 3A (3000W), 5200 CT at 6A (6000W), and 2600 CT at 12A. Oil insulation. Final is RK63's. Write for complete list and make bid. Bill Engles, 1236 So. 12 St., Fort Smith, Arkansas.

FOR SALE—Pincor 200W rotary converter, 110 d.c. to 110 a.c. 60 cy., with radio filter, perfect condition, $35. W. Bergman, 81-18 - 166 St., Jamaica 3, N. Y.

WANTED—Basic tape recording unit, or complete recorder. Will pay cash or trade other electronic equip. Chas. H. Russell, Radio Service Co., Fayetteville, Alabama.

FOR SALE OR TRADE—Approx. $400 worth of radio test equip., tubes, tools, parts, Rider Manuals, etc. Make an offer. Will consider trading for tape recorder. Ed Delzenski, 99 No. Spring St., Bloomfield, N. J.

FOR SALE OR TRADE—Triplett model 1620-21 tube tester; Triplett model 1200-C VOM; model BQC and model QC condenser checker. Want scope. Raymond Julian, 337 So. Third St., Steelton, Pa.

WANTED—The book "The Inventions, Researches, and Writings of Nikola Tesla," by Thomas Commerford Martin. Published in 1894 by the Electrical Engineer, N. Y. Leland I. Anderson, 127 Seymour Ave. S. E., Minneapolis 14, Minn.

SELL OR TRADE—Sun-Kraft ultra-violet lamp, $40; Navy wire recording unit, needs motor and amplifier, $25, or typewriter. M. Metzarek, 2174 Melvina Ave., Chicago 39, Ill.

FOR SALE OR TRADE—BC-375 E transmitter; R.A. 34-J power supply; B.C-348-Q receiver. Want TV set. Jack's Radio, 521 Texas Ave., Mart, Texas.

FOR SALE—Gon-set 3-30 converter, good, no holes or marks on cabinet, $35; HQ-129X with spkr., excellent, $160. A. G. Stavros, 3125 - 33 St., Long Island City 6, N. Y.

WANTED—Used Cornell-Dubilier capacitor bridge, model BN. State condition and price. Tony's Radio & TV Co., 5211 Southwest, St. Louis 9, Mo.

WANTED—Freq. meter L.M.; Precision sig. gen, E-200C; McMurdough transmitters 700 and 701. H. I. Griffiths, 39-82 65 Pl., Woodside, L. I., N. Y.

FOR SALE—Dumont 114-9-T 14" Cathode Ray tube. Any reasonable offer. A. M. Corey, 39 Donald Pl., Staten Island 10, N. Y., N. Y.

TRADE—Tube checker, Star, model TE-1, excellent condition, has had very little use. Want light caliber revolver. H. N. Schwartz, 726 W. Lynwood Street, Phoenix, Arizona.

FOR SALE—Meissner Analyst, model 9-1040, excellent, with manual and probes, $70; G.E. model TC-3A tube and battery tester, $30; model 201 Crystaliner sig. gen., $30. George V. Hanold, Box 133, Wonewoc, Wisconsin.

FOR SALE—Two 50 watt RCA power amplifiers, MI-4288J for 117 volts and MI4288K for 117 or 234 volts. Also pre-amp for same. Will take $100 for all. Brennan Utilities, 515-17-19 Ouachita Ave., Monroe, La.

FOR SALE—Simpson model 260 VOM, with instructions, two sets of leads, excellent condition, with leather carrying case, $30, f.o.b. or best offer. S. Blatt, 1404 N. Powhatan St., Arlington, Va.

FOR SALE—National 183 SW receiver and speaker with NBF unit, 6 months old, recently realigned by National Service agent, $200 cash. Bert Folsom, 2650 Cherokee Ave., Oakland 5, California.

SELL OR TRADE—BC348-O converted to 110V a.c., with 4" matched speaker, in good operating cond. Also 1947 Buick Sonomatic radio. Want Speed Graphic or Graflex. Thomas E. Hastings, 819 Montgomery Ave., Bryn Mawr, Pa.

FOR SALE—Rcvr. and xmtr, tubes and parts, grid dip osc. and other test instruments, photo eye units, radio books, small portable battery radio, power supplies. State your needs. O. C. Vidden, Fertile, Minn.

URGENTLY NEEDED—One DA-F11 German power tube. Also need 35mm camera. Have misc. parts, tubes, xformers, resistors, condensers, etc., for sale. Bill Hagara, Box 224, Slickville, Pa.

FOR SALE—E-200-C Precision sig. gen., used few hours, $50. J. Sovina, 432 Beaumont St., Warrior Run, Pa.

TRADE—Need signal generator in good working condition. Will swap for ten 6T8 surplus TV tubes, never used, list value, $29. Ben's Radio Service, 120 Gatling Pl., Brooklyn 9, N. Y.

FOR SALE—Rider Manuals, vol. 1 to 16 inclusive, excellent, $125. Going out of business. Anthony Messina, 337 Jefferson Ave., Bristol, Pa.

FOR SALE OR SWAP—2 tube testers, $10 and $25; several code keyer units and tapes, $5 to $30; Astatic 707A mike, $10; dual a.c.-d.c. voltmeter 0-1000V, $12.50; playback, $10; Want instructograph tapes, Morse resonator and sounders, cameras, guns, etc. H. Leigh, 197 N. 14th, San Jose 12, Calif.

SELL OR TRADE—National School Radio and TV Course. Best offer accepted. Jay Laffan, 22 Ogden Ave., Dobbs Ferry, New York.

FOR SALE OR SWAP—Three Mail-O-Voice magnetic voice recorders; two 2C39 lighthouse tubes. Each item $20 or best offer. Want TV tubes or Riders. W. R. Mathews, 46 Locust Dr., Kenilworth, N. J.

WANTED—Surplus Volt-Ohm-Meter, 1-666, in good condition. Cash or trade. Wesley W. Brogan, 306 Bethlehem Pike, Ambler, Pa.

FOR SALE—Used TV sets; Masco tape recorder, 375, $90; S-38, $22; 3" scope, $35; HQ120X, $85; XE No. 10, $12; Triplett tube tester, 1213, $20. L. A. Quinlan, 8609 - 3rd Ave., North Bergen, N. J.

WANTED—Recorder, BC 1016; rcvrs. BC 312, BC 342, S 36, S 36A, Hammarlund SP 400X. Good condition only, name your price. R. Blum, 250 W. 91st St., N. Y. C.

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TRADE—Latest type new Emerson portable, model 643A, 4 band, all wave, 115V a.c.-d.c., battery, and 230V a.c., complete with batteries and European plug, in original carton. Want oscilloscope or sweep generator. Philip Abbruscato, 1538 - 58th St., Brooklyn 19, N. Y.

FOR SALE—One TU-17A tuning unit; two BC-729-C antenna tuning units, complete; back issues of Radio Craft, Radio Maint., Service; old type tubes. What have you in TV service parts, etc. Bill's Radio and TV Service, 9937 Carpenter St., Chicago 43, Illinois.

WANTED—7" TV set, either in running condition or very close to same. Kindly state condition and price. Alan Klein, 90 Callender St., Dorchester 24, Mass.

SELL OR SWAP—Warner Brush Electroplater, a.c. model, complete with supplies. Want disk recorder, 3-speed record player, recording tape, or a mimeograph machine. Louis Golubovsky, 364 Rockaway Parkway, Brooklyn 12, N. Y.

WANTED—AN/APR-4 rec., tuning units; ARC-1, ARC-3, TS-174/U, radar, lab equipment, tubes, etc. Price and describe in first letter. Littell, Farhills Box 26, Dayton 9, Ohio.

FOR SALE—Sig. gen., series E-200-C, excellent, $55; radio tubes, 9001 - 9002 - 9003 and 6J6 for 35 cents each. Robert L. Wenk, 611 West Clinton St., Howell, Mich.

SELL OR TRADE—Ludwig 4 x 16 all metal snare drum, with hard fibre case, drum sticks, wire brushes, and drum stand; also 16mm mag loading movie camera. Want Rider Manual No. 15. Alvin E. Nagle, 11 N. Duke St., Lancaster, Pa.

WANTED—BC-348 converted to a.c. Would prefer broadcast band reception. John J. Sweeney, 4953 W. Walton St., Chicago 51, Ill.

FOR SALE OR TRADE—10" TV set with 6" speaker and all tubes including 10BP4, less cabinet, in good cond. Want $50 or communications rec. in extremely good cond., or test equip. Fred Unterleitner, 900 Summit Ave., N. Y. C., N. Y.

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FOR SALE—RCA service notes, 23-28, 31-32, 33, 34, and 35, $1.50 ea. postpaid. M. Herman, 417 Raritan St., Camden 5, N. J.

WANTED—General Electric type GYA2 audio oscillator, new or used. Jacques A. Kurtz, 642 East 23rd St., Brooklyn, N. Y.

FOR SALE OR SWAP—Garrard record changer, model 30A, intermix type, 78 r.p.m., $10 plus shipping, or VTVM in exchange. M. Relson, 49 Jayson Ave., Great Neck, N. Y.

FOR SALE—16" Techno-Craft professional-type overhead recording mechanism, good condition, never used, $50. Leland Sheldon, 1321 State St., Osage, Iowa.

SWAP—Model HD High Standard pistol, 22 cal., 6½" barrel, very good. Also recent National Schools Radio Course, with radio. Want surplus transmitters and receivers. Emil Kalar, Box 11, So. International Falls, Minnesota.

SELL OR TRADE—75 radio and TV rec. tubes, RF and IF amplifier, power output, multi-purpose, rectifier, magic eye, diode, VR. $75 for the lot, or what have you? Complete list on request. Sol Feigelman, 62 W. 52 St., N. Y. 19, N. Y.

FOR SALE AND TRADE—Have Mallory 6-AC-4 battery charger and 1/3 h.p. capacitor start G.E. motor, and older type tubes. Want gasoline motor. Urbany Radio, 1302 N. Milwaukee Ave., Iron Mountain, Mich.

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FOR SALE—Two TV picture tubes (both glass rectangular), 17BP4A, $35, 20DP4A, $65. Top quality. Richard G. Gould, 333 Central Park West, New York 25, N. Y.

FOR SALE—Type 650-A General Radio impedance bridge, hardly used, in original carton with instruction manual, $225. Kiyoshi Kasai, 3324 W. Fulton Blvd, Chicago 24, Ill.

SWAP OR SELL—60 watt converter, 6V d.c. to 110V a.c.; isolation xformer; auto "A" eliminator; Tungar Bat. charger; electric time switch. Everything, $50, or trade for portable typewriter, movie projector or camera, films, etc. Or what have you? Stanley, 2748 Meade St., Detroit 12, Mich.

TRADE—Hallicrafters S-20-R in good cond. for Savage lever action rifle in good cond. John Roberts, Wheeler Mich.

SELL OR TRADE—Three auto radios. Need 6V bat. eliminator and Sams Manuals. Chas. E. Propst, Box 106, Mona, W. Va.

FOR SALE OR TRADE—Tubes, also 2V tubes; B-flat clarinet; spinning rod and reel. Want tubes and tackle. Frank Popma, Orange City, Iowa.

FOR SALE—.351 self loading Winchester rifle, $65; 33 Winchester rifle, $55. Both in good cond. with open and peep sights. F. R. Magee, R. D. 2, Greenwich, N. Y.

FOR SALE—Excellent NRI signal tracer, model 33, $35 or best offer. Herbert Batten, 145 East Main St., Gloucester, Mass.

WANTED—Hallicrafter or similar make communications receiver in good cond. Thomas's Radio Repair Company, P. O. Box 551, Jacksonville 1, Fla.

SALE OR TRADE—Twenty 6H6 radio tubes; Supreme deluxe 89 tube tester and volt meter combination. Want good key cutting or key duplicating machine. Will trade or pay cash. Norman Radio Service, 112 Douglas Ave., Rockwood, Tenn.

FOR SALE—Radio shop, little competition, good equip., hundreds critical tubes, repair parts, etc., reasonable. Details on request. J. H. Wyatt, Searcy, Ark.

FOR SALE—Supreme tube and set tester, model 500 automatic. Needs repairs. Will take best offer. Fred Mergard, Sr., 2331 N. Hancock St., Philadelphia 33, Pa.

SELL OR TRADE—R89/ARN-5-A plane guide receiver in original condition, complete with tubes, never used. Want VTVM with probes and instructions in first class order. Leo Wentz, 1880 Madison St., Brooklyn 27, N. Y.

WANTED—Custom built radio for 1941 Chevrolet, need not be in working condition, appearance must be good. Tuck Radio and TV Service, Point of Rocks, Md.

FOR SALE—Masco Dual Disc recorder, phonograph PA comb., $75 f.o.b.; Brush wire recorder, Navy model, $50 f.o.b. Larry Otis, 12204 Leffingwell Rd., Norwalk, Calif.

FOR SALE—Copies of QST, 1931 through 1950, complete and in good shape, $20. Also a Radiola III receiver, complete with WD-11 tubes, no battery, $20. Carl P. Utterback, 1770 Locust St., Denver 7, Colorado.

FOR SALE—Stock of tubes and parts, Sams Photo Facts, American Flyer train sets. From recently closed radio shop. Send for list. B. Blatt, 8 First St., Haverstraw, N. Y.

SELL OR SWAP—Ham components, playback equipment, TV service equip., xformers, relays, xmitting tubes. Send for list. Want mobile equip. C. Osiecki, 65 Vine St., Ansonia, Conn.

FOR SALE OR TRADE—Signal tracer, in good condition, slightly used. Want good 16mm sound movie film. M. J. Difini, 358 Esplanade, Hackensack, N. J.

FOR SALE—10" G.E. TV console combination, model 802, automatic record changger, variable reluctance pick-up, AM-FM radio, excellent condition, $275 or best offer. Harry E. Wallin, Williams Bay, Wis.

TRADE—Photographic equipment, 35mm enlarger, lenses, cameras, etc., for portable radio or automobile radio. J. Terleph, 205-19 118th Ave., St. Albans 11, L. I.

SELL OR SWAP—16mm projector, 10 films and 25 sound records; five 35mm films; sprayer; 38-40 Win. rifle; 3 typewriters; 200 German tubes. Want DCH25 Phillips tube, test equip., or what? Wm. F. O'Brien, 3928½ So. Harvard Blvd, Los Angeles 37, Calif.

FOR SALE—Tubes, assorted. Send your list, will give you reduction on list price. Also sig. gen., model A-200, $28. All postpaid. Albert Lord, 9 Chestnut Ave., Saylesville, R. I.

POSITION WANTED—Have 8 years experience servicing all makes of radios. Want position as television serviceman's helper. Must be in vicinity. No driver's license. Milton Maultasch, 535 Grand St., Brooklyn 11, N. Y.

FOR SALE—12½" Motorola TV set, model 12VT13, used 3 months as store demonstrator, $150 or best offer. Jack's Radio and TV, Bedford, Iowa.

FOR SALE—Motorola a.c.-d.c. and battery portable radio, 5 months old and in perfect condition. Cheap. Merrill Shupe, R 1, Gooding, Idaho.

SELL OR TRADE—7", 10", and 12" TV sets, TV tuners, parts, test equip., radio sets, tubes, etc. Ask for items you need. C. Bufano, 185 No. 15th St., Bloomfield, New Jersey.

WANTED—N.R.I. radio and TV course. State price and condition. M. J. Leheay, P.O. Box 384, Binghamton, N. Y.

TRADE—Argus A-2, F4.5 coated lens, new condition, leather carrying case and instructions; radio books. Want 7" or 10" TV set in good condition. Min Takamoto, 420 Pearl St., Monterey, Calif.

FOR SALE—Eico oscilloscope, $35. Victor Kozma, 1665 Stadium Ave., New York 61, N. Y.

SWAP—B.C. and S.W. receiver and trans. apparatus. Want camera. H. Southwick, 316 Bank St., Fall River, Mass.

FOR SALE—Precision 10-20P tube and set tester; Precision E-200-C sig. gen.; Supreme model 574 electronic set tester. All excellent. Best offer, singly or the lot. M. Rafayko, 355 N. Limestone, Lexington, Ky.

FOR SALE—ART-13, less 813. Full price, $50. Will not ship, see and pick up. Harry Vorhauer, 431 So. Escuela St., San Diego 13, Calif.

TRADE OR SELL—Used but unconverted BC-348-L radio receiver. Want 35mm camera. Phillip S. Myers, R. 3, Madison 5, Wisconsin.

FOR SALE—14W Brentwood PA system. Complete with schematic and info., $35. E. Bowley, 31-19 - 43 St., Long Island City 3, N. Y.

FOR SALE—Speco a.c. sig. tracer, EBY eye set, Detecto bathroom scale, Hermes typewriter, d.c. to a.c. 50 watt inverter, Masonite panel 13 x 15. John Moy, P.O. Box 169 Canal Station, New York, N. Y.

WANTED—Rider Manuals from vol. 11 to date. State vols. available and prices. Harry Sherman, 673 Moody St., Waltham 54, Mass.

WANTED—Magnavox 40-50 mc FM receiver strip. State condition and price. L. Albert Webb, 56 Suffolk Street, Holyoke, Mass.

FOR SALE—Rider TV Manual No. 5, $19.50; Transvision field-strength meter, $21; Clough-Brengle AM sig. gen., $21; Dumont TV tuner, $18. Want Meissner or Pilot FM tuner. W. Shirley, 474 West 238th St., New York 63, N. Y.

FOR SALE—Philco model 027 VTVM; Precision E-200 sig. gen.; Philco model 7050 tube tester; N.R.I. signal tracer. complete BC-375-E. Newell's Radio Service, 162½ Plum St., Oil City, Pa.

SELL OR TRADE—Motors, fans, office equip., grinding heads, Millen rig, 20 meter amphenol antenna, clock movements, long list of items. Want HC57, Harvey Wells rig, or? G. Samkofsky, 527 Bedford Ave., Brooklyn 11, N. Y.

WANTED—Surplus gasoline driven battery charger. Prefer 12 volt 10 amp. Swap 100-1000 kc. xtal calibrator worth $39.50. R. N. Eubank, 1227 Windsor Ave., Richmond 27, Va.

FOR SALE—Millen 90881, $70; Millen xctr. 10 and 20m coils, $17.50; Bud 66" enclosed cabinet, $25; pwr. supply 1200 vct 200ma, $17; 300w 10m phone xmtr., needs fixing, 2 pwr. supplies, mod. 815 final. Irving Koplow, 1522 Vyse Ave., Bronx, N. Y.

FOR SALE—7" Transvision TV with magnifier in good shape. Works fine. Make offer. Griener Radio Service Co., 299 S. Elmwood Ave., Buffalo, N. Y.

FOR SALE—Hallicrafter S-40 receiver, perfect condition. D. J. Meade, 111-25 202nd St. Hollis, N. Y.

FOR SALE—Rider Manuals, $10 ea.; Sam's Photofacts, $10 ea.; Rider Chanalyst, priced low; 15 watt amplifier, $15. Carrs TV Center, 15-17 Kelley Sq., Worcester 4, Mass.

FOR SALE—Sprague Tel-Ohmike model TO-3, resistor and condenser checker, with instructions, $50. Virgil A. Weibemann, 35 Sherwood Forest, Belleville, Illinois.

WANTED—Sweep generator suitable for TV service work. G. Hattendorf, 5751 Wintrop Ave., Cincinnati 24, Ohio.

WANTED—½ h.p. 110V a.c. motor (capacitor type preferred). Have surplus PE-103A dynamotor with spare brushes and power output plug. C. B. Kelley, 7204 Clovernook Ave., Cincinnati 31, Ohio.

FOR SALE—5" oscilloscope with Dumont 208 hig freq. response circuit and spare CR tube, highest offer over $65. Or will trade for first class 35mm camera and accessories. H. J. Hoffman, 325 W. Magnolia, Inglewood, Calif.

WANTED—Complete used Candler System Junior Scientific code course. Good condition, reasonable. Rupert Freeman, 2108-33 Ave., Meridian, Miss.

FOR SALE—Radio-phono cabinet for table model RCA Victor No. V-100. George Wolos, 2120 N. 4th St., Philadelphia 22, Pa.

TRADE—Compact wire recorder in 8 x 11 x 13" metal case containing mike, speaker, amplifier, and five spools wire, bass and treble boost, high gain low noise. Want 6" metal lathe. R. T. Beck, 1305 Jefferson, Racine, Wis.

FOR SALE—Altec 603 15" speaker, $30; Racon CHU-2 tweeter, 3 mos. old, with crossover chokes, $25. All f.o.b. C. B. Parkinson, Jr., 431 Encinitas, Monrovia, Calif.

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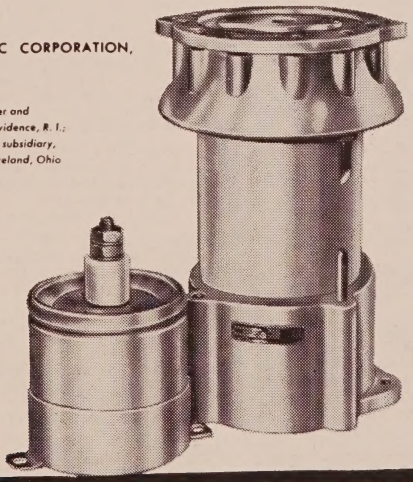

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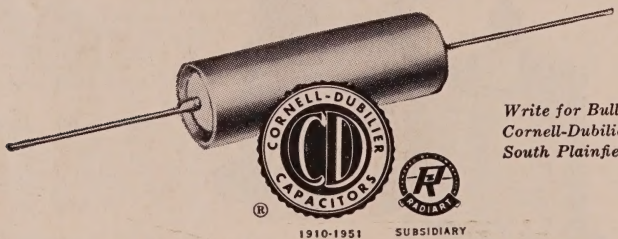

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South Plainfield, N. J.

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